

What is claimed is:

1. Carbon nanotubes for use in a fuel cell which are directly grown over a carbon substrate and whose internal and external walls are doped with nano-sized metallic catalyst particles uniformly to a degree of 0.3-5 mg/cm<sup>2</sup>.

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2. The carbon nanotubes of claim 1, wherein the metallic catalyst particles are derived from at least one selected from the group consisting of Pt, Ru, Fe, Co, and alloys or mixtures of the forgoing elements.

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3. The carbon nanotubes of claim 1, wherein the carbon substrate is carbon cloth or carbon paper.

4. The carbon nanotubes of claim 1, wherein the carbon nanotubes are branched off.

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5. A method for fabricating carbon nanotubes, the method comprising:

(a) uniformly distributing metallic catalyst particles over a carbon substrate;

and

(b) supplying a carbon source gas at a constant rate under atmospheric

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pressure and reacting the carbon source gas with the metallic catalyst particles at a temperature of 400-900 for 1-120 minutes.

6. The method of claim 5, wherein the carbon source gas is ethylene, carbon monoxide, carbon dioxide, or methane.

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7. The method of claim 5, wherein step (a) of uniformly distributing metallic catalyst particles over the carbon substrate is performed by electrophoresis, thermal spraying, sputtering, or chemical vapor deposition.

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8. The method of claim 5, wherein step (b) further comprises applying microwaves or radio waves to activate the carbon source gas into plasma state.

9. The method of claim 5, wherein step (b) further comprises adjusting reaction conditions such that the growing carbon nanotubes branch off.

10. The method of claim 9, wherein adjusting the reaction conditions comprises supplying a reducing gas after about 10 minutes from the supply of the carbon source gas.

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11. The method of claim 10, wherein the reducing gas is hydrogen gas or ammonia gas.

12. The method of claim 9, wherein adjusting the reaction conditions comprises adjusting the flow rate of the carbon source gas and reaction temperature and time.

13. A fuel cell using the carbon substrates grown over the carbon substrate according to claim 1 for an electrode.

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14. A fuel cell using the carbon substrates grown over the carbon substrate according to claim 2 for an electrode.

15. A fuel cell using the carbon substrates grown over the carbon substrate according to claim 3 for an electrode.

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16. A fuel cell using the carbon substrates grown over the carbon substrate according to claim 4 for an electrode.

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